DOCUMENT RESUME

ED 391 692 SE 057 838

AUTHOR Yulaelawati, Ella
TITLE New Ways of Science Teaching: The Active and Professional Support Project.
PUB DATE 28 Sep 95
NOTE 10p.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Educational Change; Educational Strategies; Elementary Education; Foreign Countries; *Professional Development; Science Curriculum; *Science Instruction; Science Process Skills; Scientific Methodology; Teacher Improvement
IDENTIFIERS Australia; Indonesia; Reform Efforts

ABSTRACT

Indonesian primary school children are taught to memorize science facts and learn only routine skills. School science lessons focus on low-order thinking as required on the frequent district formative tests and a national year six examination. Because of this emphasis on testing, students show little interest in asking questions about everyday scientific observations. The Ministry of Education and Culture, concerned about this trend, initiated a teacher professional development project to try to change teachers' and educators' behavior in the teaching and learning process in order to raise the level of student understanding. This initiative, the Active Learning and Professional Support (ALPS) project, is described and reviewed in this paper. The ALPS project is perceived as three interrelated dimensions of change: learning processes and school development, school development and continuing professional support for teachers, and new patterns for inservice training. This project has provided teachers with skills necessary to involve children to speculate about phenomena, classify materials, observe carefully, use simple measuring equipment, infer, carry out experiments, interpret data, and control variables. Impact of ALPS implementation and associated problems are also discussed in this paper. (JRH)

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by
Ella Yulaelawati
Graduate School of Education,
University of Queensland
QLD 4072

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NEW WAYS OF SCIENCE TEACHING: THE ACTIVE AND PROFESSIONAL SUPPORT PROJECT

Ella Yulaelawati
Graduate School of Education, University of Queensland, QLD 4072

ABSTRACT

Indonesian primary school children are taught to memorise science facts and learn only routine skills (Beeby, 1979). Their teachers present information directly to students for regurgitation on tests. These test results are a measure of each student's ability to memorise, rather than of their scientific understanding (Moegiadi et al., 1990). School science lessons focus on low-order thinking as required on the frequent district formative tests and a national year six examination. Because of this emphasis on testing, students show little interest in asking questions about everyday scientific observations.

The Ministry of Education and Culture has become concerned about this trend and has initiated a teacher professional development project to try to change teachers' and educators' behaviour in the teaching and learning process in order to raise the level of student understanding. This initiative, the Active Learning and Professional Support (ALPS) project, will be described and reviewed in this paper.

INTRODUCTION

Science teaching in Indonesian primary schools, as in many other countries, has its own problems and successes. Problems in the Indonesian context mostly are related to teachers' competence and availability of resources and class size. The majority of Indonesian primary teachers were graduated from Primary Training College (SPG) which was a specialised type of Secondary School. Although the new updated, teacher training college now offers a diploma (II) program, consisting of two years of teacher training after the completion of secondary school, the upgrading of a vast number of existing primary teachers can not be achieved in a short time.

Despite this apparent lack of education, there are some good classroom teachers who are able to teach science well, but they are in short supply. The Indonesian government attempted to address these obvious needs through the promotion of a project termed 'Active Learning and Professional Support (ALPS). The improvement in the teaching of Science, Maths, Indonesian Language, and Social Studies were the aims of ALPS. This occurred largely through the provision of professional support for classroom teachers.

For science, the focus topics were classroom organisation, how to use the environment as a learning resource and problem solving in the science and technology classroom. Notable successes were observed in teacher behaviour through extensive use of a wider range of textbooks, increased use of local resources, the manufacture of low cost teaching learning

aids, the provision of a variety of learning experiences and the greater use of problem solving techniques in the development of science and technological skills.

SCIENCE TEACHING BEFORE ALPS

In 1979 BP3K (now is called Balitbang Dikbud or Office of Research and Development in Education and Culture) initiated an in-depth study of grade VI of selected primary schools in rural and urban areas to survey practices. This study showed that teachers continued to convey information rigidly with lectures and questions and answers; they used the blackboard as the only teaching aid and as a scribbling pad rather than for the presentation of a logical sequence of ideas and provided little individual attention to pupils (BP3K, 1979, p14).

Regarding this study, Young (1982) described that, in teaching science, teachers see science as a body of knowledge to be conveyed to pupils. The majority of lessons consisted of teachers telling student factual information. There was also a belief that at the primary level, process and attitude goals were least important. Moegiadi (1979) in his study found that the grade six students were fairly strong in recall of facts but rather weak in the rest of the sub-elements of the cognitive domain such as understanding, critical thinking, application of concepts, evaluation, and drawing conclusions.

In terms of in-service training, the style consists of 50% general sessions for didactic or pedagogic topics and another 50% for science subjects. The course method for the didactic aspect consists almost entirely of lecture sessions; hand outs, blackboard, and visual aids were rarely used. The science sessions were more lively, although there was still a great deal of lecturing. Demonstrations (which was visible only to the first two rows of participants) were often used in this training. A series of practical activities on a circuit basis was also sometimes employed. Most of the trainers encouraged participants to make as many lesson plans as possible so that they would have at least some teaching material for their classes. These lesson plans were very rigid and stressed content. Although there was an attempt to apply experimental methods, the activity was only to verify a simple scientific phenomenon.

Based on these conditions, Balitbang Dikbud - Curriculum Development Centre set up the Primary Science Project (PSP) to improve science teaching in primary schools. This project (started in 1980) focused on the teaching and learning process to develop science process skills which involved pedagogic activities such as: (i) devising science activities and their worksheets to provide the development of process skills, and (ii) devising test item to assess process skills.

The use of worksheet also created a dilemma. It was good to provide different learning experiences for the pupils, but the worksheets were expensive and required preparation and duplication. The nature of the task given to the pupil on the worksheets also gave some cause of concern. Most tasks demanded little of the pupils beyond the collection of different sources - although in itself an innovation. However in many cases only one source the prescribed textbook, was required.

The PSP did not affect staff development at school and district levels. The knowledge and skills remained only with teachers who had been involved in PSP training; therefore, PSP was terminated in 1983 and linked to the Active learning and Professional Support (ALPS) project.

PROVISION OF PROFESSIONAL SUPPORT IN THE ALPS PROJECT

It was then realised that the vast differences which existed at the classroom level, hopefully, might be minimised by better supervision. As indicated by BP3K (1979, p67): "Certain teachers are better able to bring about high achievement in their classes not because they are better qualified or have better facilities... but because they have better skills and inter-personal relationships with their pupils..."

Based on these concerns, the project 'Active Learning and Professional Support' (ALPS) started in 1980 in the district of West Java province, has been replicated in 10 provinces, and finally most of the ingredients of the project were disseminated through out Indonesia in the 1994 curriculum.

The general aims of the project are to construct working models that explore the quality of instruction through the improvement of the quality of support for teachers at the local level, and to monitor progress and modify these models during the course of the project as a result of periodic project evaluation. More specifically the project was to: develop a model to raise the quality of teaching and learning; improve professional assistance; increase the quality of inpectors, head teachers, teachers and pupils; raise the relationship between school and the community.

The ALPS project is perceived as three interrelated dimensions of change: (1) learning processes and school development; (2) school development and continuing professional support for teachers; (3) new pattern for in-service training.

Dimension 1: Learning Processes and School Development

The function of the ALPS project is to raise the level of achievement of children and to make the learning process more appropriate to their needs. The project required that a new approach to primary education be adopted: children would learn by working together on tasks, asking questions, conducting investigations, and employing problem solving strategies. The classroom situation is changed by selecting from among a variety of learning activities, reorganising seating and study arrangements, and by using a wider range of learning resources. Classrooms are made to be intellectually stimulating environments. As well the children's work is displayed.

In terms of school development, teachers and their head teachers are to work together on designing instruction, selecting local content, creating better classroom practices, providing resources, and collaborating with the local community.

Dimension 2: Continuing Professional Support for Teachers

The ALPS project adopted a new interpretation of supervision. Teachers, head teachers and supervisors are expected to meet regularly in KKGs (teachers' working groups) to discuss problems and to share and develop new approaches. These meetings provide the teacher with the school-based, institutional, and collegial support that is necessary to bring about change in the classroom. The KKGs provide a means of development of the skills required for tackling problems related to teaching. They allow teachers to participate in assessing their

needs, understanding their problems, conducting self-evaluation and building their knowledge and skills. The head teacher is seen as an important professional guide for teachers, and as such is encouraged through the KKG process when strategic decisions are made.

The KKG structure comprises a professional support system which operates at the subdistrict level within each of the ALPS provinces. This system entails a subdistrict level Inspector Working Group (KKPS), a Teacher Resource Centre (PKG), and Head Teacher Working Groups (KKKS). In addition, there are a number of Teacher Working Groups or KKGs (one for every cluster of 5 - 8 schools).

KKG development is phased. Selected participants (teacher, head teachers, district and provincial education staff) are trained at the provincial level to better understand and improve the delivery of their respective responsibilities. This training is conducted at least once a year. Between these training sessions, an implementation phase is conducted in the workplace (education offices and schools); KKGs are trained, monitoring and fields consultancies are enacted, school meetings are conducted to further disseminate knowledge and promote active learning skills, and advisory teachers are appointed by teaching peers and head teachers. In essence, the KKG training focuses on encouraging teachers to become: (i) observant, (ii) critical of their own practices by reflecting and sharing beliefs between peers, (iii) active in searching for challenges and sensitive to their implications, (iv) more open in sharing their experiences, (v) more active in making decisions, and (vi) more committed to the active learning and professional support processes. National and regional training workshops are also conducted to increase the capabilities of educational managers and inspectors.

Dimension 3: New pattern for in-service training

Teachers need professional support in carrying out their difficult daily work. This support most effectively come from those people in the education system who work closely with teachers. The in-service training held under the ALPS includes these people, viz., their fellow teachers, their head teachers and their inspectors. In addition to knowing the course content and activities, inspectors and head teachers also experienced their own in-service program. They were required to attend a course on 'what' and 'how' to supervise teachers in their daily work. One of the main aims of this in-service training is to change the role of inspectors from administrative inspection to providing professional help to teachers. As a result of this training, more participants took part in changing their teaching. Heads and teachers are involved in guiding their fellow teachers, a role hitherto reserved for the inspectors. The process of teaching helps those who teach to confirm knowledge and strengthen positives attitudes. The in-service training became far more activity-oriented, a totally lecture based program was not acceptable any more. The content of training was based on mostly school experiences and local work. The KKGs became the main source for developing a training program to meet local demands.

However, there is still much room for improvement, especially in preparing a master plan for a series of courses. There was little thought given to building up a sequence of competences. Other problems like lack of continuity may have been caused by inappropriate selection of the participants for example, local policy makers sometimes send new participants to an advanced course.

NEW WAYS OF SCIENCE TEACHING IN THE ALPS PROJECT

PSP has provided teachers with skills to involve children to speculate about phenomena, classify materials, observe carefully, use simple measuring equipment, infer, carry out experiments, interpret data or control variables. Most difficulty in developing these process skills was encountered through insufficient resources, and the curriculum (1975) was not flexible enough to accommodate changes in teaching science.

It was recognised that the implementation of changes should be developed on the 'willingness to extend the individual's capacity for learning', both for the individual child or the school staff member. For this behavioural change to occur, problems should be seen and accepted as an inherent aspect of implementation. Thus, coping with a problem is an essential skill for teachers as well as for children. New ways of science teaching emphasise these problem solving skills.

This innovation improved teachers' competencies in the ability to: (1) plan and manage the time available for learning more effectively; (2) recognise and understand objectives relating to processes of thinking as well as concepts; (3) recognise and provide activities for individual differences among learners; (4) organise and manage teaching and learning through a combination of class, group and individual activities appropriate to the needs of learners, and the nature of science topics; (5) use the environment and children's direct experiences as a resource for learning and provide a stimulating and effective environment for learning through good class organisation and display; (6) provide a variety of learning experiences leading towards a more active and problem-centred approach; (7) receive and provide better feedback between the teacher and the children and also to stimulate feedback between the children themselves; (8) evaluate learning outputs, not only through the work produced daily by the children but also in the attitudinal changes observed from time to time.

Adopting a problem solving approach would also accommodate an incorporation of technological and environmental aspects into primary science. Problems for this context, could be defined as tasks for children which provide the opportunities to learn how to learn, to design, to give reasons, to use logic, to perform actions in tackling problems, to manipulate and interpret data (Matahelemual, 1991).

An example of using this problem solving approach can be shown in the 'Banana Project'. This project asked children to investigate all parts of a banana plant: leaf, fruit, stem, roots, and major leaf vein. This project resulted in different solutions to the problem between urban and rural schools. The rural schools tended to provide more practical solutions by demonstrating various uses of banana: cooking a banana cake, making woven mats, making boats, explaining the use of banana roots for medicine, using the banana plant for decoration, garments, wrapping tobacco or food, and accessories. They also worked well to investigate starch.

In urban schools, however, the solutions were emphasized scientific investigation: the strength of a banana leaf was investigated by rubbing, pulling, and loading with heavy things. The children also wove banana fibres from banana stem by soaking it, trying to get the fibres and dying them afterward.

The varied active learning experiences in science have enabled the role of the student to change from being a passive recipient to becoming an active participant. This happened because of the change in teachers' attitude in teaching science. Teachers no longer become the only source of information; they are more inclined to act as change facilitators and work with the children in a friendly partnership. This is a big step forward for Indonesian primary teachers, who often provided rhetorical questions which drew a choral response from all children. Students are now questioning, show curiosity, explore and research actively in partnership with the teacher to acquire knowledge.

THE IMPACT OF THE PROJECT

Change in Science Curriculum Development

The content of the 1975 science curriculum was over loaded. As a result the teacher used the easiest and quickest methods - chalk and talk - to achieve the target of completing the compulsary content. In order to weaken this reliance on content, the ALPS together with the primary science project, introduced process skills and contributed criteria for science content simplification by selecting science concepts as a basis for the 1984 curriculum. With the 1984 curriculum emerged an emphasis on active learning and the suggestion that 'processes' are as important as the content product of learning.

By 1994, science was being taught as an independent subject from grade 3 to grade 6 by a classroom teacher, previously it was taught from grade 1. Because of the emphasis on basic skills, mostly the 3R's in the early years, science is now integrated with language lessons for grades 1 and 2. The objectives of science education emphasised developing awareness of protecting and sustaining environmental resources, national pride, and the Glory and Supremacy of God Almighty by applying scientific concepts, processes and skills including problem solving skills (GBPP IPA, 1994). This goal goes beyond science curriculum. The underlying principle of the goal is to cultivate moral values and ethics in the intelligent people.

Impact of ALPS Implementation and Associated Problems

There was considerable pride and enthusiasm over the ALPS implementation in the pilot areas. Both teachers and pupils were adopting a more active approach to learning, taking more initiative and approaching learning more constructively and creatively.

On the other hand, the penetration of the new practices and approaches beyond pilot areas was relatively shallow. Instead of understanding the principles of the ALPS project, active learning became a 'fashion'. Although there was insufficient acquisition about the principles of ALPS for the schools outside the project, there was pressure from local educational administrators to disseminate implementation of ALPS widely beyond the pilot school without adequate preparation and proper professional and financial support. This resulted in a bush fire in the different interpretations of active learning. The use of worksheets, displays on the wall and sitting children in groups instead of rows were considered as indicators of active learning. This was due to a wrong interpretation as a result of a short visit to a pilot area.

There was a period, however, when the children, although sitting in groups, actually worked as individuals. When the class was arranged in this manner, the teacher still taught the class as a single whole, and there was little change in pedagogy. All science textbooks, learning and teaching materials were published with the label of active learning. Teachers tended to copy the ideas without really understanding the principles of learning actively. Managing group work was also problematic. Groups, typically, were allocated one of two worksheets and, as each group completed its work, it waited until all others had finished. This practice meant that, as the lesson progressed, an increasing number of pupils spent time being inactive while the last group hurried up to complete their work. The worksheet was written for the sake of verification, in a 'cook-book' manner, without problem solving or open ended investigations required.

Because of the considerable contrast with earlier classroom practices, many of the features in the implementation of ALPS relate to a 'critical mass' achieved by the centres. There was a strong top-down pressure to review the dissemination of this model in order to prevent future bush fires. However, centres for better practices with their strong beliefs about the significant progress made in the overall quality of science education were reluctant to give up. Skilled and knowledgeable teachers and head teachers are hampered from sharing their enthusiasm and problems in practising ALPS' principles with district and higher level officials who are not familiar with this practice. Little support for the classroom ALPS teacher occured because of conflicting beliefs between teachers, educational administrators, policy makers and teacher-educators. In the project, practical knowledge was valued. On the other hand the marrying of theory and practice is, often not attempted. This led to the decision for slowing the rate of national dissemination of the ALPS project by strengthening the centre for better practices by producing handbooks and instructional videos. However, the professional support system has continued to be disseminated nationally, and active learning principles are articulated and included in the 1994 national curriculum.

Indeed this approach is the basis and the only strategy in negotiating the present World Bank supported project: Primary Education Quality Improvement Project (PEQIP). After the years of PEQIP implementation, an in-depth study is required to investigate: (1) to what extent PEQIP has been able to develop the desired models of the teaching-learning process, professional support and staff development, and teacher support system, in particularly through in-service training, as the most crucial problem in developing Indonesia; and (2) to what extent the dollar input to PEQIP has been effective in comparison with the traditional and ALPS approach where financial support has been minimal. More studies on this subject are required .

CONCLUSION

Teachers control their own personal growth by practising what they have learnt, assessing their practices and having more opportunities for making decisions. In this sense teachers are learners of better practices, suited more to their own schools' conditions.

In Indonesian science education, the majority of pre-service training has led to very little creative problem solving. Thus, teacher-educators do not provide positive role models for the students. The ALPS project has offered teachers skills and confidence for tackling open-ended problems in primary school . Hopefully this will enables them to use their own skills in order to cope with any changes. However, the loss of control in dissemination of this

project has led to some misinterpretations and incorrect actions of the ALPS implementation.

The new science curriculum tries to integrate active learning principles and professional support for teachers. The relationship between agencies responsible for pre - and in - service training, curriculum development and professional development, therefore, needs to be improved to support primary science teachers in its implementation.

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